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EUPHORBIA CYPARISSIAS IN FRUIT.

Walter Deane.

During the thirty years covering my botanical experiences, I have never met with a patch of *Euphorbia Cyparissias*, L., a European species naturalized in North America, without examining it carefully in the hope of finding fruiting specimens exhibiting capsules and ripe seeds. My search was always in vain. The young developing ovary protruded a short distance from the involucre and gave promise of fruition, but that was all. It bent over the edge of the cup and withered away. I was quite used to my repeated failures, as year after year went by, and I became reconciled to leaving forever on my desiderata list the fruit of this species. A joyful surprise, however, was in store for me, and the long waiting was quite worth the keen satisfaction that followed.

It was in the summer of 1909 when I was visiting my friends, Mr. and Mrs. Gilbert N. McMillan on their large estate in Shelburne, New Hampshire, in the valley of the Androscoggin River, a few miles northeast of the White Mountains and between 700 and 800 feet above sea level. On the afternoon of July 1, the day after my arrival, as a party of us were strolling near the house, I observed a patch of *Euphorbia Cyparissias* by the roadside. I stepped up to it, as was my custom, to examine it, and to my delight every plant was loaded with dead-ripe capsules. It was a joy indeed. The situation was on a dry bank of poor soil, some three feet above the level of the road and sparingly covered with grass. For the first time I saw the granular pods and smooth grayish seeds of this species.[1]

[1] In view of the conflicting statements as to the color of the seeds of *Euphorbia Cyparissias*, Gray's Manual, in recent editions, calling them "dark-colored," and

I learned from my host and hostess upon inquiry that the Cypress Spurge was by no means unknown on the farm. This weed was first noticed there some six or seven years ago, occurring in a small patch on either side of the stone wall near one of the main entrances from the road, the spot where I first observed it. Thence it spread over the fields rapidly, though sparsely, and in two or three years had covered, at intervals of varying distances, an area of twenty acres. It was flourishing under the most varied conditions, as I found on examination the next day, but was always heavily laden with fruit. In one piece of very barren, rocky soil it was perfectly at home, while the largest, thriftiest, and most recent colony that I found was in a part of the hay field that had been cut the year before, in 1908, and later in the summer plowed and fertilized, thus offering what I have always considered uncongenial conditions for the growth of this plant. Some weeks later Mrs. McMillan noticed a few specimens of the Euphorbia springing up here and there over this area, and they spread with great rapidity. This I realized on visiting the spot and I was astonished to see how the species had invaded a new territory and obtained so strong a footing in so short a time. The plants were large and vigorous and were loaded with ripe capsules to an extraordinary degree. On a single specimen, consisting of four stalks, there were, by careful count, eighty-eight capsules. That means two hundred and sixty-four seeds. The plants were growing very closely together and they covered an area of several square rods, while a net-work of root-stocks, a short distance below the surface of the ground, showed what a firm hold this species can secure when once it has found congenial conditions. This vigorous system of root-stocks is of course sufficient to maintain the

Hooker's Student's Flora of the British Islands characterizing them as "smooth globose pale * * * almost white," a search through the library of the Gray Herbarium has been made to ascertain what the various writers have said on this subject. The most satisfactory account and one which agrees very closely with the color of the Shelburne seeds is in Syme's English Botany, viii. 108 (1873) as follows, " Seeds quadrate-subglobular, smooth, dim, ashy-grey, with a rather large suborbicular caruncle." In view of the very meagre statements that appear to exist on this question, seeds were submitted to an expert in color, Mr. F. Schuyler Mathews. He describes the color as follows, " The seed color is light bluish gray, to deeper violet gray, with slight surface iridescence under magnification in a good light; caruncle large, golden ochre." The difference in the color of the individual seeds appears to be due to the varying degree to which the outer light gray somewhat friable coat of the seed is rubbed off, the inner layers being of deeper hue. The seeds, including the caruncle, are from 2.25 to 2.5 mm. in length. The capsule is depressed globose with three rounded lobes. It is 3 mm. long and slightly more in diameter. The surface is green, minutely roughened with whitish warts.

species for a long time without the need of fruit, and it is but one example in many to the same effect.

After this experience I naturally wanted to know how other botanists had fared in this regard, and first I examined the large collection of specimens in the herbarium of the New England Botanical Club without finding a single fruit. In the Gray Herbarium, however, I found two developed capsules, one on a plant collected by the roadside in Almanarre, Department of Var, France, on April 17, 1905, by F. Raine, and the other on a plant collected at Deidesheim, Bavarian Palatinate, Germany, no date, by Schultz Bipontinus. The latter specimen is from the herbarium of George Thurber. I then wrote to over thirty botanists having herbaria and I received replies from all but two or three. In but two instances did I receive records of fruit.

Mr. W. W. Eggleston wrote me that in the Columbia University Herbarium, now at the New York Botanical Garden, there are three fruiting specimens, one from this country and two from Europe. The first one, which is mislabelled *Euphorbia Esula* L., was collected at Arrochar, Staten Island, N. Y., June 8, 1895, by W. C. Kerr. On this plant are more than twenty pods. Most of them "appear plump and are well filled." Another specimen which is from the Meisner Herbarium, was collected at Bern, Switzerland, in 1827. The collector's name is not given. "This specimen has no pods on the plant, but there are more than twenty-five seeds in a pocket. . . . Many of the seeds. . . . are plainly ripe." The third specimen was collected near Nyborg, Fyen, Denmark, June 15, 1901, by K. Wiinstedt. "This has at least seven pods." Most of them "appear plump and are well filled." Judge J. R. Churchill has a specimen that he collected at Blumenthal, Mürren, Switzerland, on August 31, 1907. It "has at least 12 well developed fruits on its 16 peduncles. Some of the capsules are ripe and dehiscent, showing within the plump, large, seeds." As the collector was not looking for a fruiting specimen, it is fair to infer that there was more fruit in the vicinity.

The above records of fruit from but five stations in Europe and but two in this country, Shelburne, N. H., and Staten Island, N. Y., in so many herbaria examined, shows pretty conclusively that the plant has in a great measure lost its power of setting fruit, at least in America. It doubtless does fruit more or less freely in its native European home, but it is strange that so few fruiting specimens should exist in our large herbaria on this side of the water, the species being such a common one,

and the fruit such a diagnostic character. The records at least show where fruiting specimens are to be found.

I will quote from a few replies received, to show how diligently and yet unsuccessfully the fruit has been sought for by keen-eyed botanists. Mr. C. H. Bissell of Southington, Conn., says, "Have looked for years for fruit of *Euphorbia Cyparissias*, but have never found any. Cannot say that it never fruits, but it certainly does not do so usually." Dr. E. H. Eames of Bridgeport, Conn., writes, "I have never seen any fruit of *Euphorbia Cyparissias*, although constantly on the lookout for it. It seems to be one of those instances where fruit is of little consequence for propagation, the root-system sufficing." Miss Anna Shepard writes from Burlington, Vt., "We have no specimens of *Euphorbia Cyparissias* with ripe seeds either in the University Herbarium or in the Pringle Herbarium. Dr. Pringle says he has never seen it in fruit, and he finds that his European specimens have no seeds." Dr. J. N. Rose writes from the National Museum, Washington, D. C., "We have about 25 specimens of *Euphorbia cyparissias* L., but none of them are in fruit." Prof. C. F. Millspaugh of the Field Museum of Natural History, Chicago, Ill., says, "Of the 50 or more sheets in my private Euphorbia herbarium and the sheets in the herbarium of this Museum there is none upon which the capsules are at all developed. These sheets are both from America and from Europe.... I have searched upon hands and knees through many patches of this species in various parts of this country in the hope of finding a capsule, having needed the same for a number of years in my work on the genus. I have, however, never seen a developed capsule on the plants in the United States. The plant appears, without doubt, to distribute itself entirely through the root system (in regard to its life in America). How frequent capsular development may be in Europe I am unable at this time to state." Mr. J. M. Macoun of the Geological Survey of Canada writes from Ottawa as follows, "I have looked over all our specimens of *Euphorbia Cyparissias*, both from Canada and the United States and find no specimens with ripe seeds, although we have quite a number collected late in the summer."

These replies are quite significant and they indicate very clearly, to my mind, that fruit is lacking in almost all our herbaria not because the collectors have not happened to look for it in most cases, and were content with flowering specimens only, but because fruit is very scarce, in this country primarily, and doubtless to a certain degree in

Europe. Its great scarcity makes me wonder more and more at my Shelburne experience. What was the peculiar local influence which caused fertility at this station and time? Was it a matter of soil-conditions, weather, insect visitors, or the purely casual reappearance of an ancestral trait? To these questions there is no answer as yet apparent. I shall be interested to learn whether the plants fruit again as abundantly, if at all, this coming season. I sincerely hope that the search of those enthusiasts above mentioned will be rewarded as mine was.

Cambridge, Massachusetts.

AGROPYRON CANINUM AND ITS NORTH AMERICAN ALLIES.[1]

Arthur Stanley Pease and Albert Hanford Moore.

The genus Agropyron is, as is well known, a very puzzling one. Two recent revisions [2] have, in the opinion of the writers, not entirely cleared up the difficulties presented by the relatives of *Agropyron caninum* (L.) Beauv. The difficulty of indicating the rank and relationship of the members of the group by a series of independent species, as has generally been attempted, arises from an extraordinary amount of intergradation. *Agropyron caninum* passes, by the loss of its awns, to *A. tenerum* Vasey; the latter to *A. violaceum* (Hornem.) Lange, by the shortening and often thickening of the spikes; this again, on the one hand to *A. violaceum* (Hornem.) Lange var. *latiglume* Scribn. & Sm., by the flattening out of the keel and the presence of pubescence on the spikelets, or to *A. violaceum* (Hornem.) Lange var. *andinum* Scribn. & Sm., by the presence of awns. Forms in which the awns are strongly bent outward have been described as *Triticum caninum* L. var. *Gmelini* Ledeb., which may also be regarded as *Triticum*

[1] The authors desire to express their thanks to the staff of the Gray Herbarium for the privileges and valuable suggestions received from them.

[2] F. Lamson Scribner and J. G. Smith, Native and Introduced Species of the Genera Hordeum and Agropyron. Studies of American Grasses, U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 25–23 (Feb. 6, 1897); C. V. Piper, Agropyron tenerum and its Allies, Bull. Torr. Bot. Club, xxxii, 542–547 (Oct. 21, 1905).

or *Agropyron caninum* with long, recurved awns, as, indeed, Ledebour considers it. Again, by a lengthening out of the awns, there is an imperceptible transition from *A. caninum* to *A. Richardsoni* (Trin.) Schrad., as defined by Scribner and Smith.[1] It is also possible to view *A. violaceum* (Hornem.) Lange, together with its varieties *latiglume* and *andinum*, as short-spiked representatives of *A. caninum*. Another noteworthy feature of the group is a striking parallelism, in that almost every variety has a smooth and a hairy development.

The Agropyra in question belong to the non-stoloniferous group. While this distinction, based on the presence or absence of stolons, may seem an artificial one, it is so generally considered important in the Gramineae and Cyperaceae that we cannot with Ascherson and Graebner subordinate *A. violaceum* to *Triticum repens*,[2] nor can we follow Beal,[3] who describes *A. repens* (L.) Beauv. var. *tenerum* (Vasey) Beal.[4]

The earliest specific name in the group is *A. caninum* (L.) Beauv., which goes back to the name *Triticum caninum* L., of the first edition of the Species Plantarum. Linnaeus here discusses two species, *T. repens* and *T. caninum*. Of the former he says, "radice repente," of the latter, "calycibus subulatis quadrifloris aristatis." The authors of the synonyms of *T. caninum* cited by him all indicate plants with aristae. The first synonym given is *Gramen caninum non repens elatius spica aristata* Moris.[5] The two remaining synonyms contain the word, "repens," and the accompanying descriptions state that the plants are stoloniferous; the species is therefore a mixture, as so many of the Linnaean species are. The first mentioned synonym and the type-description are clear, and must hence be taken as conclusive. Morison says that the stem of his plant is glabrous, but is not explicit as to the leaves. Buxbaum repeats the description given by Morison. Both give figures — Buxbaum's being especially good — each of which plainly represents a glabrous species with aristae of medium length, such as *A. caninum* has been held to be. Linnaeus was not satisfied with his first treatment, so that in the Flora Suecica[6]

[1] U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 29 (Feb. 6, 1897).

[2] *T. repens* L. *B. T. biflorum* (Brign.) A. & G. A. *virescens* (Lange) A. & G. Syn. Mitteleurop. Flora, ii, 1, 654 (Dec. 10, 1901).

[3] Grasses N. A. ii, 637 (1896).

[4] It is perhaps worthy of note that many of the variations described below, based upon length of spikes and of awns and presence of pubescence and glaucousness, are paralleled, in greater or less degree, by variations in *A. repens* (L.) Beauv.

[5] Pl. Hist. Univ. Oxon. iii, 177, t. 1, fig. 2, sect. 8 (1715); Buxb. Pl. minus cogn. circ. Byzant. Orient. Observ. cent. iv, 29, t. 50 (1733).

[6] Ed. II, 39 (1755).

he calls the plant *Elymus caninus*, a name taken up by a number of subsequent authors. Under these three names, *Triticum caninum*, *Elymus caninus*, and *Agropyron caninum*, our plant is discussed in a multitude of European and American works. Nowhere does there seem to be the slightest difference of opinion as to its nature. The name *Triticum sepium* Lam.[1] seems to be a synonym of *Agropyron caninum*, and has generally been so regarded. The name *Festuca nutans* Moench? also seems to be properly included here. Moench[2] himself says of his plant, "An *Elymus caninus* Linnaei."

Very closely related to *A. caninum* (L.) Beauv. is *A. tenerum* Vasey. It differs from it in no important character, except the absence of awns, and this is not constant, for specimens are not rare which it is difficult to place. Some attempt has been made to distinguish eastern plants from it on the one hand, and from *A. violaceum* (Hornem.) Lange on the other. Scribner[3] unites them as a species under the name of *A. Novae-Angliae*. An extremely painstaking examination of the subject has led us to agree with Hitchcock[4] that this species cannot be clearly separated from the *A. tenerum* of the West. It may be interesting to compare what Scribner says: "In regard to the Agropyron for which I have proposed the name *Novae-Angliae*, I must think it quite distinct from the *A. tenerum* of the west, although it suggests that species somewhat in habit. It looks more like a caespitose form of *A. repens*. I believe it has been included under *A. violaceum* by some authors, but it certainly is distinct from that species, as represented in our herbarium, from northern Europe and from the Rocky Mountain region."[5] "The plant described in Gray's Manual, ed. 6, 672, is the western form which is doubtless true Agropyron violaceum, Lange, while the variety mentioned 'with longer usually pale narrow spikes and attenuate often long-awned glumes,' is the plant here described as *Agropyron Novae-Angliae*."[6] Thus it is seen that Scribner himself calls attention to the affinity of the eastern plant. Through it, *A. tenerum* Vasey passes readily to *A. violaceum* (Hornem.) Lange.

Scribner and Smith[7] have described *Agropyron violaceum* (Hornem.)

[1] Flore Franç. iii, 629 (1778); Encycl. Meth. (Bot.) ii, 563 (1786).
[2] Meth. Pl. Hort. Bot. Agr. Marburg, 191 (1794).
[3] In Brainerd, Jones, and Eggleston, Fl. Ver. 103 (1900).
[4] Gray, Man. ed. VII, 167 (1908).
[5] In Brainerd, Jones, and Eggleston, Flora Vt. 9 (1900).
[6] L. c. 103.
[7] U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 30 (Feb. 6, 1897).

Lange var. *latiglume*, the salient feature of which is wider glumes covered with a fine pubescence. In other members of our group the glumes are merely minutely ciliate on the margins. In most of the group it is difficult to measure the glumes, because of their shape, for they are folded strongly so as to have a prominent keel. In *A. violaceum* var. *latiglume* the keel is much flattened or almost wanting; that is, the glumes are, as it were, unfolded, thus giving the appearance of width. This fact is certainly more striking than any actually greater breadth, even if that exists. The variety was described from the West, but all of the Arctic material in the Gray Herbarium, except one violet-spiked specimen of *A. violaceum*, answers to the description of it. This suggests the bare possibility that *A. violaceum* (Hornem.) Lange var. *virescens* Lange may belong here.

The intimate relationship between *A. violaceum* (Hornem.) Lange and *A. caninum* (L.) Beauv., referred to above, is brought out by Beal,[1] who says, "Perhaps this [*A. violaceum*] is a northern or alpine form of *A. caninum* R. & S., from which it differs in having a culm 30–50 cm. high, leaves 3–4 in number,[2] blades proportionately shorter, spikes 3–8–12 cm. long, narrow, strict, more or less tinged with violet. Spikelets 3–5 flowered; floral glume wider than in *A. caninum*, not so firm, nerves more prominent, awn short or none; palea shorter than the floral glume, pectinate-ciliate." Even these differences do not all hold. A violet tinge is occasionally found in *A. caninum*, while entire absence of violet color is common in *A. violaceum*; the palea- and glume-characters are not good. *Triticum violaceum* Hornem.[3] is the first published name, but the first varietal appellation, which we believe expresses the rank best suited to this plant, is *Triticum biflorum* Brign. *β Hornemanni* Koch.[4]

Plants with greener, more stocky spikes have been distinguished as *Agropyrum violaceum* (Hornem.) Lange *β. virescens* Lange.[5] This tendency is the common one in the White Mountains, while the other is known from the Arctic Region and the West. However, the White Mountain development is not unknown in the West, where one also finds the slender-spiked, narrow-leaved plant of Greenland, probably

[1] Grasses N. A. ii, 639 (1896).

[2] This character we find to be inconstant.

[3] Flora Dan. xii, t. 2044 (1834).

[4] Syn. Flor. Germ. Helv. ed. II, ii, 953 (1844). Koch bases his variety directly upon *Triticum violaceum* Hornem.

[5] Consp. Flor. Groenl. 155 (1880).

representing the type,[1] together with a thick-spiked plant having a strong violet color. Every variation in leaves from revolute to flat and broadish is to be noted. Not one of the members of the group under discussion fails to show an indefinite violet tinge at times. The color shades off into the colorless or green condition too imperceptibly to give rise even to color forms. The tendency is a very common one throughout the Grasses, so that it does not seem noteworthy.

Following Piper, l. c., Hitchcock, in the seventh edition of Gray's Manual,[2] uses for *Agropyron violaceum* (Hornem.) Lange the name *A. biflorum* (Brign.) R. & S. The original publication of *Triticum biflorum* by Brignoli was not accessible to us; but fortunately it is copied by Roemer and Schultes.[3] The conspicuous point in the original description, reiterated by them, is that the glumes are 3-nerved. The glumes of our American plants are 5–7-nerved. This distinction has been held by monographers of the genus to be important, yet, although Hitchcock credits our plant with having 5–7 nerves he calls it *A. biflorum*. Another, not insignificant objection to accepting the name is the peculiar range. Roemer and Schultes note it from, "Monte Matajur,[4]" and while later European authors extend this range a little, all that we have found agree that it is a quite local plant.[5] European authors, who should be more familiar with *A. biflorum* than the meagre representation of rare European plants in American herbaria permits us to be, do not generally hold the view that *A. biflorum* and *A. violaceum* are identical, but only closely related. Ascherson and Graebner, for example, treat the latter as two varieties of a subspecies, *biflorum*, of *Triticum repens* L., A. *virescens* and B. *Hornemanni*. Nyman[6] believes that *Triticum biflorum* is distinct, and says, "gramen rarius." Ascherson and Graebner are of the opinion that Nyman's plant is *virescens*. The following quotation from their Synopsis is indicative of the uncertainty which surrounds the name *T. biflorum*: "Eine sehr kritische Pflanze, die trotz ihrer fast stehts sehr eigenartige Tracht kaum durch scharfe Merkmale von T. eu-repens getrennt ist." These authors also note the three nerves, "Hüllspelzen lanzettlich (wenigstens

[1] At least, there is a specimen of this phase in the Gray Herbarium which was collected in Greenland by *J. Vahl*, the collector of the type. It may well be the material of the type collection itself.

[2] Ed. VII, 166 (1908).

[3] L.— R. & S. Syst. Veg. ii, 756 (1817).

[4] Near Görz.

[5] The reference of it to Syria by the Index Kewensis is probably a mistake.

[6] Consp. Flor. Europ. 841–842.

die untere) 3-nervig." In view of all this, it does not appear justifiable to consider the name *T. biflorum* synonymous, by the Vienna Rules, with *A. violaceum*. Furthermore it is not necessary to do so, because, for us, the first name which can be taken up in the varietal rank, is, as we have shown, *Triticum biflorum* Brign. *β. Hornemanni* Koch. Transitional material to *Agropyron tenerum* Vasey is especially common from the Gaspé Peninsula. In fact, if this region alone were taken into account, one would be inclined not to make any distinction at all.

A co-type of *A. brevifolium* Scribn.[1] needs a word of comment. It differs from the ordinary forms of *A. violaceum* only in having many sterile shoots; the length of the leaves is unimportant. The larger number of shoots hardly constitutes a character, so that the name *A. brevifolium* may well be relegated to synonymy.

The next variety which needs to be discussed is the one described in correct form under the genus Triticum as *T. caninum* L. var. *Gmelini* Ledeb.[2] Oddly enough, the correct combination has been actually used, though not technically made, for in the Bulletin of the Torrey Botanical Club,[3] Vasey speaks of *Agropyrum caninum* (L.) Beauv. var. *Gmelini* Ledeb., a combination not made by Ledebour, and so far as we are aware, not formally published by anyone. According to the Vienna Code, a combination is not considered made unless reference is given to a previously published name, which in this case was not done.

The three last mentioned plants may best be treated as parallel varieties. There exists a pubescent form of *Triticum caninum* var. *Gmelini*. The type of *Agropyron Gmelini* (Ledeb.) Scribn. & Sm. var. *Pringlei* Scribn. & Sm. in the Gray Herbarium, as well as most of the specimens so labelled, is evidently this form. No other constant difference from *A. Gmelini* has been detected. A specimen in the Gray Herbarium labelled *A. Scribneri* Vasey, which also does not differ essentially from our plant, is noted, on the sheet, by the word, "Type." In fact, the affinity is recognized by Vasey, who says of it, "It is perhaps the *A. caninum*, var. *Gmelini*, Ld." As there may be some doubt about the identity of *A. Scribneri*, since the specimen labelled

[1] U. S. Dept. Agr. Div. Agrost. Bull. no. 11, 55 (July 20, 1898).

[2] Flora Alt. i, 118 (1829); figured, Ic. Pl. Nov. imperf. cogn. Flor. Ross. iii, 16, t. 248 (1831).

[3] x, 128 (Dec. 1883).

'type' is not technically such, Vasey not having cited any type, it seems wisest to derive the name of the form from *A. Gmelini* var. *Pringlei*, the identity of which cannot be questioned.

The last plant to be considered is that called by Scribner and Smith *Agropyron Richardsoni* (Trin.) Schrad. The evidence for identifying this name with the plant in question is extremely weak. The original description of *Triticum Richardsoni* Schrad.[1] reads as follows: "Agropyr. Richardsonii Ind. sem. H. Berol. 1832. — America borealis arctica ? ♃ — A Trit. repente vulgari differt foliis firmioribus serius involutis spica graciliori; spiculis minus distichis paucifloris, floribus longius; aristatis." It is true that the use of the expression, "Trit. repente," may not be accurate, but is there any reason for assuming this? Surely, "longius aristatis," is a mild statement for the longest awns in our group. Besides the published evidence, there is some supposed further documentary evidence. Scribner and Smith[2] say, "*Triticum richardsoni* Trin.[3] in Reliq. Scrad. [sic.], Linn., **12**: 467 (1838), according to a specimen from the St. Petersburg Academy in the Gray Herbarium." The only specimen of this species from St. Petersburg in the Gray Herbarium is labeled: "**Ex herbario horti Petropolitani**, 'Triticum Richardsoni' = T. violaceum, Hornem." The expression, "= T. violaceum, Hornem.," is added in the handwriting of Dr. Gray, and the quotation marks seem to be in an ink of the same date, leaving "Triticum Richardsoni," carelessly written in an unknown hand, as the only original label. Under "*A. richardsoni*,"[4] Scribner and Smith cite as seen in the Gray Herbarium: "British Columbia: Richardson, type collection." A careful search has revealed no such specimen. Probably "Gray Herbarium" is an error.

There is, however, a good name for the plant under discussion, namely, *Agropyrum caninum* (L.) Beauv. var. *unilaterale* (Cassidy) Vasey;[5] *A. unilaterale* Cassidy.[6] Cassidy's description follows: "Flowering glume finely scabrous, flattened and obscurely nerved below; apex rougher, acutely two-toothed, the mid-nerve terminating in a rough, straight awn 2 inches long.[7] Banks of streams 7,000 to

[1] Linnaea, xii, 467 (1838).

[2] U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 29 (Feb. 6, 1897).

[3] There is no evidence that Trinius is the authority.

[4] The original authority for *A. Richardsoni* is Hort. Berol. It appeared as a nomen nudum in the Ind. Sem. Hort. Bot. Berol. 1831 Collect. (1832), a copy of which A. H. Moore was permitted to see at the Berlin Botanical Museum.

[5] Contr. U. S. Nat. Herb. i, 279 (Oct. 31, 1893).

[6] Colo. State Agr. Coll. Exper. Sta. Bull. no. 12, 63 (July, 1890).

[7] We wish to call attention especially to his measurement of the awns, which is even rather extreme.

8,000 ft. [Colo.]." This description leaves little doubt as to the meaning of the name, and, indeed, Scribner and Smith consider it a synonym of *A. Richardsoni*. As the first varietal name Vasey's combination is the correct one. The following quotations will throw some light on the nature of *A. caninum* (L.) Beauv. var. *unilaterale* (Cassidy) Vasey, and also upon its relationship. Ramaley[1] says: "From this description [Vasey's] and from an examination of specimens distributed by the Department of Agriculture it appears that this plant is very near to A. violaceum (Hornem.) Lange, forma *caninoides*[2] described below; it is probable that through these formae[3] the two species[4] are related." Ramaley, having apparently read only Vasey's brief description,[5] assumes that *A. caninum* var. *unilaterale* differs only very slightly from the type.

Scribner and Smith, under *A. caninum* (L.) Beauv., write: "Forms of this, with unilateral spikes, have been referred to *A. richardsoni*, which has awns three or four times as long as those of *caninum*, and the flowering glume bidentate below the origin of the awn. Slender forms have been referred by collectors to *A. tenerum* Vasey, and forms with short compact spikes and short awns to *A. violaceum* Vasey."

Scribner and Smith[6] describe *Agropyron tenerum* Vasey var. *longifolium*. We have seen no specimens of this, and are therefore unfortunately unable to discuss it. see p 2

We may now proceed to the taxonomic treatment and diagnoses. We desire to call attention to the fact that the measurements in all cases represent the usual or average limits, and that measurements may be observed which lie above or below them. For example, if the awns are said to be 1–3 cm. long, some awns may be found 0.8 or 4 cm. long, but this would not apply to more than a small proportion of the awns in the given spike. Approximate averages are given whenever possible, to show the proportional size of the spikes, which is an important character.

[1] Geol. Nat. Hist. Surv. Minn.— Minn. Bot. Studies, Bull. no. 9, 3, 107 (June 9, 1894).

[2] We believe this form to be inseparable from *A. caninum*. It does not seem best to retain names for intermediate forms of this sort, where no sharp line exists, for there is no more reason for using one name than several.

[3] *A. violaceum* (Hornem.) Lange f. *caninoides* Ramaley and *A. violaceum* (Hornem.) Lange f. *violacescens* Ramaley. The latter is Ramaley's name for *A. caninum* var. *unilaterale*.

[4] Ramaley means here *A. caninum* and *A. violaceum*.

[5] Vasey does not mention the awns.

[6] U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 30 (Feb. 6, 1897).

KEY TO THE VARIETIES AND FORMS.[1]

a. Awns mostly under 1.5 cm. long, or none. b.
b. Awns mostly 7–15 mm. long. c.
c. Plants glabrous . . . . . 1. *A. caninum*
c. Some or all of the leaves or sheaths hairy. d.
d. Plants not glaucous . . . . . 2. *A. caninum* f. *pubescens*
d. Plants glaucous . . . . . 3. *A. caninum* f. *glaucum*
b. Awns none, or not exceeding 6 mm. e.
e. Spikes generally long and slender (average length about 12–14 cm.): usually lowland plants. f.
f. Plants glabrous . . . . . 4. *A. caninum* var. *tenerum.*
f. Leaves, sheaths, or both provided with hairs. g.
g. Plants not glaucous . 5. *A. caninum* var. *tenerum* f. *ciliatum.*
g. Leaves and sheaths glaucous.
6. *A. caninum* var. *tenerum* f. *Fernaldii*
e. Spikes generally short and thick (average length about 7–8 cm.): usually alpine or far northern. h.
h. Glumes with a fine pubescence. 7. *A. caninum* var. *latiglume.*
h. Glumes minutely ciliate on the margins, not pubescent. i.
i. Leaves glabrous . . . . 8. *A. caninum* var. *Hornemanni.*
i. Leaves pilose above.
9. *A. caninum* var. *Hornemanni* f. *pilosifolium.*
a. Awns mostly 1.5 cm. long or over. j.
j. Spikes short and thick, average length (exclusive of terminal awns) 5–7 cm. k.
k. Awns ascending, not strongly recurved.
10. *A. caninum* var. *andinum.*
k. Awns strongly recurved (often bent out nearly at right angles). l.
l. Plants glabrous . . . . . 11. *A. caninum* var. *Gmelini.*
l. Leaves (rarely sheaths also) provided with hairs.
12. *A. caninum* var. *Gmelini* f. *Pringlei.*
j. Spikes (inclusive of awns [2]) 7.2–20 cm. long. m.
m. Plants glabrous . . . . . 13. *A. caninum* var. *unilaterale.*
m. Sheaths and often leaves provided with hairs.
14. *A. caninum* var. *unilaterale* f. *ciliatum.*

1. AGROPYRON CANINUM (L.) Beauv. Spikes long and slender, 7.2–21.6 cm. long (exclusive of the terminal awns), 3–10 mm. wide (exclusive of the awns); awns 5–25 mm. (mostly 7–15 mm.) long,[3] generally spreading, not rarely ascending (seldom giving the spike a unilateral appearance).— Agrost. 102, 146 (1812); L.— R. & S. Syst. Veg. ii, 756 (1817); Reichenb. Ic. Flor. Germ. Helv. i, 29, t. 19, fig. 1381 (1850);[4] Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 29 (Feb. 6, 1897).

Gramen caninum non repens elatius spica aristata Moris. Pl. Hist.

[1] Any key to this group would fit only the more typical cases, because of the intergradation.

[2] The awns are included because their ascending or approximate character makes them an integral part of the spike.

[3] If the low measurements (5–6 mm.) hold throughout a spike, the specimen will be better treated as no. 4.

[4] Color of the awns purplish.

Univ. Oxon. iii, 177, t. 1, fig. 2, sect. 8 (1715); Buxb. Pl. minus cogn. circ. Byzant. Orient. Observ. cent. iv, 29, t. 50 (1733).

Triticum caninum L. Sp. Pl. ed. I, 86 (1753); Zinn, Cat. Pl. Hort. Acad. Agr. Gott. 67 (1757); Sm. Flora Brit. i, 159 (1800); Host, Ic. Descript. Gram. Austr. ii, 20, t. 25 (1802); Engl. Bot. t. 1372 (1805); Flora Dan. ix, 1, t. 1447 (1818); Sm. Engl. Flora, i, 184 (1828), etc.

Elymus caninus L. Flora Suec. ed. II, 39 (1755), Syst. Nat. ii, 879 (1760), Sp. Pl. ed. II, i, 124 (1762); L.— Willd. Sp. Pl. i, 469 (1798); Schkuhr, Bot. Handb. i, 56 (1791), etc.

Triticum radice fibrosa, foliis hirsutis, locustis quinquefloris, aristatis Haller,[1] Hist. Stirp. Indigen. Helv. 212 (1768).

T. sepium Lam. Flore Franç. iii, 629 (1778), Encycl. Meth. (Bot.) ii, 563 (1786); Lam. & DC. Flore Franç. iii, 83 (1805).

Festuca nutans Moench? Meth. Pl. Hort. Bot. Agr. Marburg, 191 (1794).

Braconotia elymoides Godr. Flore Lorr. ed. I, iii, 193 (1844).

Braconnotia elymoides Godr. Flore Lorr. ed. II, ii, 454 (1857).

Agropyron violaceum (Hornem.) Lange f. *caninoides* Ramaley, Geol. Nat. Hist. Surv. Minn.— Minn. Bot. Studies, Bull. no. 9, 3, 108 (June 9, 1894).

A. caninoides (Ramaley [2]) Beal, Grasses N. A. ii, 640 (1896).

Triticum caninum L. var. *typicum* A. & G. Syn. Mitteleurop. Flora, ii, 1, 642 (Dec. 10, 1901); Schinz & Keller, Flora der Schweiz, ed. II, ii, 30 (1905).

Agriopyrum caninum (L.) Schinz & Keller, Flora der Schweiz, ed. II, ii, 30 (1905), attributed to Beauv.

Specimens examined: Labrador? (*Prof. Brunet*): Quebec, Between Baldé and the Baie des Chaleurs, Bonaventure River, Bonaventure Co., August 5, 6, & 8, 1904 (*J. F. Collins, M. L. Fernald,* and *A. S. Pease*); River Ste. Anne des Monts, Gaspé Co., August 16, 1906 (*M. L. Fernald* and *J. F. Collins*, nos. 170 and 170a); Shore of Boundary Lake, Kamouraska Co., July 31, 1878 (*C. G. Pringle*); Vicinity of Cap à l'Aigle, August 19, 1905 (*J. Macoun*, Herb. Geol. Surv. Can. no. 68982): New Brunswick, (*J. Fowler*): Maine, Fort Fairfield, July 5, 1893 (*M. L. Fernald*, no. 196); Along St. John River, St. Francis, 1881 (*K. Furbish*, no. 13); Houlton, Aug. 26, 1897 (*M. L. Fernald*); Hartford, July 18, 1901 (*J. C. Parlin*, no. 1427): Vermont, North Pownal, August 1, 1898 (*J. R. Churchill*): Massachusetts, Concord, July 6, 1888 (*C. W. Swan* and *C. W. Jenks*): Connecticut, Somers, July 20, 1904 (*C. H. Bissell*): Pennsylvania, Pocono Mountain, August 2, 1860 (*T. C. Porter*): Michigan, Jackson, July 11, 1838 (*Houghton*): Wisconsin, Beloit, 1860 (*T. J. Hale*): Minnesota,

[1] A Postlinnaean name of Prelinnaean form.

[2] Erroneously cited by Beal, as R. Pound, from the title page of a preceding article on the Mucoraceae.

Thompson, Carlton Co., July 6, 1891 (*J. H. Sandberg*, no. 1407): NEBRASKA, Lake region of Grant Co., 3½ miles N. E. of Whitmer, July 29, 1893 (*P. A. Rydberg*, no. 1617); MONTANA, East Gallatin Swamps, July 24, 1896 (*P. A. Rydberg*, no. 3191): WYOMING, Fort Bridger, August 5, 1873 (*T. C. Porter*): WASHINGTON, Loomis, June 18, 1902 (*T. C. Porter, D. Griffiths*, and *J. S. Cotton*, no. 340): NEVADA, King's Cañon, Ormsby Co. (*C. F. Baker*, no. 1286): CALIFORNIA, Jess Valley to Blue Lake, northeastern Cal. (*D. Griffiths* and *B. Hunter*, no. 444): ATHABASKA, Dunvegan, Peace River, July 28, 1903 (*J. M. Macoun*, Herb. Geol. Surv. Can. no. 59546): BRITISH COLUMBIA, Vicinity of Comox, Vancouver Is., July 5, 1893 (*J. Macoun*, Herb. Geol. Surv. Can. no. 50).

2. A. CANINUM (L.) Beauv. f. **pubescens** (Scribn. & Sm.) Pease & Moore, comb. nov. Sheaths and upper surfaces of the leaves finely and closely pubescent, or only with scattered hairs (often on sheaths only, more rarely on leaves only).[1]

Agropyron caninum (L.) Beauv. var. *pubescens* Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 29 (Feb. 6, 1897).

Specimens examined: QUEBEC, Falls of Bonaventure River, Aug. 5–6, 1904 (*J. F. Collins, M. L. Fernald*, and *A. S. Pease*); Margin of Bic River, Rimouski Co., July 29, 1907 (*M. L. Fernald* and *J. F. Collins*, no. 915); Elephantis Landing, Brome Co., July 30, 1902 (*A. S. Pease*, no. 147): NEW BRUNSWICK, Tom's Is., Restigouche River, July 30, 1896 (*G. U. Hay*): MAINE, Ledgy river bank, Houlton, Aug. 12, 1909 (*M. L. Fernald*, no. 1364); Kelly Point, Pembroke, July 31, 1909 (*M. L. Fernald*, no. 1368); City Camp to Roebar's, Valley of Wassataquoik River, July 17, 1900 (*M. L. Fernald*): NEW YORK, Axton, July 14, 1899 (*W. W. Rowlee, K. M. Wiegand*, and *G. T. Hastings*): MICHIGAN, Sulphur Is., Thunder Bay, Lake Huron, near Alpena, July 13, 1895 (*C. F. Wheeler*): OREGON, Stein's Mountains, August, 1901 (*D. Griffiths* and *E. L. Morris*, no. 609).

3. A. CANINUM (L.) Beauv. f. **glaucum** Pease & Moore, f. nov. vaginis aut foliis aut utrisque glaucis pubescentibusque ornata.

Type specimen: MAINE, Kelly Point, Pembroke, July 31, 1909 (*M. L. Fernald*, no. 1367).

4. A. CANINUM (L.) Beauv. var. **tenerum** (Vasey) Pease & Moore, comb. nov. Spikes generally very long and slender, 5.7–23 cm. long (average length about 12–14 cm.), 3–12 mm. wide, awnless or with awns up to 6 mm. in length.

Agropyrum tenerum Vasey, Bot. Gaz. x, 258 (Apr. 1885); Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 29 (Feb. 6, 1897).

Agropyron repens (L.) Beauv. var. *tenerum* (Vasey) Beal, Grasses N. A. ii. 637 (1896).

A. Novae-Angliae Scribn. in Brainerd, Jones, and Eggleston, Flora Vt. 103 (1900), name, p. 9 (see also foot-note, p. 9).

[illegible]

[1] In this case hairs always scattered.

[illegible] p. 205

Specimens examined: Newfoundland, Bay of Islands, July 27, 1908 (*E. H. Eames* and *C. C. Godfrey*, no. 5878): Quebec, Grande Coupe, Percé, Gaspé Co., August 19, 1904 (*J. F. Collins, M. L. Fernald*, and *A. S. Pease*); Allen's Ravine, Mt. Albert, Gaspé Co., July 26 & 28, 1906 (*M. L. Fernald* and *J. F. Collins*); Gravelly beach, Carleton, Bonaventure Co., July 25, 1904 (*J. F. Collins* and *A. S. Pease*), with sheaths showing a glaucous tendency observable also in the next specimen to be cited; Beach near mouth of Matane R., Aug. 6, 1904 (*F. F. Forbes*); Vicinity of Cap à l'Aigle, August 8, 1905 (*J. Macoun*, Herb. Geol. Surv. Can. no. 68981); Mt. Elephantis, Brome Co., July 30, 1902 (*A. S. Pease*, no. 148): Maine, Caribou Bog, Crystal, August 16, 1900 (*M. L. Fernald*): New Hampshire, Diamond Peaks, Dartmouth College Grant, August 15, 1907 (*A. S. Pease*, no. 10501), Mt. Webster, Bean's Grant, Aug. 21, 1908 (*A. S. Pease*, no. 11722): Vermont, Canaan, July 10, 1907 (*A. S. Pease*, no. 10088): New York, Mt. Zoar, Chemung Co., July 20, 1897 (*T. F. Lucy*, no. 11603): Ontario, Kingston, July 27, 1897 (*J. Fowler*): Michigan, Sand Point, Huron Co., August 20, 1908 (*C. K. Dodge*, no. 22): Wisconsin, Milwaukee, August (*I. A. Lapham*): Minnesota, Elmore, Iowa and Minnesota Line, July 21, 1897 (*L. H. Pammel*, no. 895): Iowa, Ames, June 27, 1893 (*F. C. Stewart*, Herb. Ia. Agr. Coll. access. no. 5470): Nebraska, Grand Is., June 23, 1897 (*L. H. Pammel*, no. 60): North Dakota, Leeds, July 3, 1901 (*J. Lunell*): South Dakota, Belle Fourche, 1897 (*D. Griffiths*, no. 389 a): Montana, Indian Creek, July 4, 1883 (*F. Lamson Scribner*), "Typical, J. G. S. '96": Wyoming, East De Lacy's Creek, Yellowstone Park, August 10, 1897 (*P. A. Rydberg* and *E. A. Bessey*, no. 3694); Crazy Woman's Creek, 1897 (*T. A. Williams*, no. 2728): Colorado, Crystal Park, 2600 m., August 1, 1901 (*F. E. & E. S. Clements*, no. 179); Gunnison, July 18, 1901 (*C. F. Baker*, no. 468); Fort Garland, 1884 (*G. Vasey*), "Typical"; Buena Vista, Chaffee Co., August 17, 1896 (*C. L. Shear*, no. 1020): Idaho, Idaho Falls, July, 1893 (*E. Palmer*, no. 357): Utah, Dyer Mine, Uintah Mountains, July 12, 1902 (*L. N. Goodding*, no. 1343): California, Crosser, Yakima Co., July 19, 1902 (*J. S. Cotton*, no. 744): New Mexico, 1847 (*A. Fendler*, no. 909): Arizona, St. John's to White Mountains, August 6–15, 1903 (*D. Griffiths*, no. 5201): Saskatchewan, 1858 (*E. Bourgeau*): Manitoba, Emerson, July 17, 1887 (*J. Fowler*): Assiniboia, Moose Jaw, July 17, 1880 (*J. Macoun*): British Columbia, Trail, June 6, 1902 (*J. M. Macoun*, Herb. Geol. Surv. Can. no. 63394).

5. A. caninum (L.) Beauv. var. tenerum (Vasey) Pease & Moore f. **ciliatum** (Scribn. & Sm.) Pease & Moore, comb. nov. Sheaths furnished with pubescence, varying from a dense covering of fine hairs to more scattered and longer ones. Leaves glabrous or with scattered hairs on the upper surface.[1]

[1] In the latter case there may be no hairs on the sheaths, a phase which seems to be more frequent in the East, while the other is more abundant westward.

Agropyron tenerum Vasey var. *ciliatum* Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 30 (Feb. 6, 1897).

A. tenerum Vasey subsp. *trichocoleum* Piper, Bull. Torr. Bot. Club, xxxii, 546 (Oct. 21, 1905).

Specimens examined: QUEBEC, Between Baldé and the Baie des Chaleurs, Bonaventure River, Bonaventure Co., August 5, 6, & 8, 1904 (*J. F. Collins, M. L. Fernald,* and *A. S. Pease*): MAINE, Lubec, Aug. 2, 1909 (*M. L. Fernald*, no. 1366); Gilead, August, 1897 (*K. Furbish*): NEW HAMPSHIRE, Randolph, August 16, 1902 (*A. S. Pease*, no. 1730), July 28, 1907 (*A. S. Pease*, no. 10769), August 17, 1907 (*A. S. Pease*, no. 10614, *A. H. Moore*, no. 4050); Three Mile Island, Meredith, Aug. 25, 1903 (*A. S. Pease*, no. 2515): VERMONT, Westmore (Type station of *A. Novae-Angliae*), July 11–12, 1900 (*W. W. Eggleston*, no. 2177): MICHIGAN, Keweenaw Co., August, 1889 (*O. A. Farwell*, no. 533): NORTH DAKOTA, Devil's Lake, Ramsay Co., July 1, 1905 (*J. Lunell*): WYOMING, Bridger Peak, Carbon Co., August 22, 1903 (*L. N. Goodding*, no. 1939); WASHINGTON, Walla Walla, June 26, 1899 (*C. L. Shear*, no. 1573).

6. A. CANINUM (L.) Beauv. var. TENERUM (Vasey) Pease & Moore f. **Fernaldii** Pease & Moore, f. nov. glauca; foliis basalibus vaginisque pubescentibus. Aliquando folia sparsim pilosa sunt.

Type specimen: QUEBEC, Vicinity of Cap à l'Aigle, August 8, 1905 (*J. Macoun*, Herb. Geol. Surv. Can. no. 68978).

Other specimens examined: QUEBEC, Mt. Ste. Anne, Percé, Gaspé Co., July 24, 1905 (*J. F. Collins* and *M. L. Fernald*, no. 36); Vicinity of Cap à l'Aigle (*J. Macoun*, Herb. Geol. Surv. Can. no. 68979): MAINE, Kelly Point, Pembroke, July 31, 1909 (*M. L. Fernald*, no. 1369); West Quoddy Head, Lubec, Aug. 2, 1909 (*M. L. Fernald*, no. 1365).

7. A. CANINUM (L.) Beauv. var. **latiglume** (Scribn. & Sm.) Pease & Moore, comb. nov. Spikes rather broader in proportion to the length than in the following, 2.2–8.2 cm. long, 5–10 mm. wide; glumes flattened out (i. e., almost or wholly without keel); spikelets and leaves finely pubescent.

Agropyron violaceum (Hornem.) Lange var. *latiglume* Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 30 (Feb. 6, 1897).

A. violaceum (Hornem.) Lange subsp. *latiglume* (Scribn. & Sm.) Piper, Bull. Torr. Bot. Club, xxxii, 547 (Oct. 21, 1905).

Specimens examined: Bear Lake; Arctic Coast (T., 65): GRINNELL LAND (*A. W. Greely*, no. 69): LABRADOR, Rama, August 20–24, 1897 (*J. D. Sornborger*, no. 263): WYOMING, Summit Mt., Bighorn Mountains, 10,000 ft., July 24, 1900 (*J. G. Jack*), "typical"; Rocky Mountains (*Douglas*, no. 77).

8. A. CANINUM (L.) Beauv. var **Hornemanni** (Koch) Pease & Moore, comb. nov. Generally plants of alpine or far northern regions; spikes 4.2–11.3 cm. long (average about 7–8 cm.), 3–9 mm. broad (average about 6 mm.); glumes strongly keeled; spikelets not pubes-

cent, simply minutely ciliate on the edges of the glumes,[1] leaves narrow or even revolute [2] to flat and broadish.

T. biflorum Authors, not Brign., e. g. Nym. Consp. Flor. Europ. 842 (1878–1882).

T. violaceum Hornem. Flora Dan. xii, t. 2044 (1834).

T. biflorum Brign. *β. Hornemanni* Koch, Syn. Flor. Germ. Helv. ed. II, ii, 953 (1844).

Agropyrum biflorum (Brign.) R. & S. var. *Trit. violaceum* (Hornem.) Reichenb. Ic. Flor. Germ. Helv. i, 30 (1850).

A. violaceum (Hornem.) Lange, Consp. Flor. Groenl. 155 (1880); Vasey, Dept. Agr. Spec. Rep. no. 63, 45 (1883); Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 30 (Feb. 6, 1897).

A. violaceum (Hornem.) Lange *β. virescens* Lange, Consp. Flor. Groenl. 155 (1880); Rosenv. Andet. Till. Grønl. Faner. Karsp. 726 (1890).

A. violaceum (Hornem.) Lange *α. genuina* Rosenv. Andet. Till. Grønl. Faner. Karsp. 726 (1890).

A. violaceum (Hornem.) Lange var. *major* Vasey, Contr. U. S. Nat. Herb. i, 280 (Oct. 31, 1893).

Agropyron brevifolium Scribn. U. S. Dept Agr. Div. Agrost. Bull. no. 11, 55 (July 20, 1898).

Triticum repens L. *B. T. biflorum* (Brign.) A. & G. A. *virescens* (Lange) A. & G. Syn. Mitteleurop. Flora, ii, 1, 654 (Dec. 10, 1901).

T. repens L. *B. T. biflorum* (Brign.) A. & G. B. *Hornemanni* (Koch) A. &. G., l. c.

Agropyrum violaceum (Hornem.) Lange f. *virescens* (Lange) Gelert, in Ostenfeld, Flora Arct. 133 (June 28, 1902).

Specimens examined: Greenland, Igalisso (*J. Vahl*): Quebec, Gulch north of Lac au Diable, Mt. Albert, Gaspé Co., July 25, 1906 (*M. L. Fernald*, no. 411): Maine, North Basin, Mt. Ktaadn, July 13, 1900 (*E. F. Williams*): New Hampshire, Alpine Garden, Sargent's Purchase, August 19, 1907 (*A. S. Pease*, no. 10600), August 7, 1896 (*E. & C. E. Faxon*); Oakes' Gulf, Cutts' Grant, August 8, 1896 (*E. F. Williams*): Wyoming, Yellowstone Lake, August 22, 1899 (*A. Nelson*, no. 6608): Colorado, near Pagosa Peak, 12000 ft., August, 1899 (*C. F. Baker*, no. 144a); North Fork of Bridge Creek, September, 1897 (*A. D. E. Elmer*, no. 676) — Type of *A. brevifolium* Scribn.): Nevada, near Virginia City, 1863-4 (*H. G. Bloomer*, no. 2068) — Mixed with variety no. 7: California, Silver Mt. Trail, 8000–9000 ft., 1864 (*W. H. Brewer*, no. 2068): Alberta, Devil's Head Lake, Banff, July 29, 1901 (*J. Macoun*): British Columbia, Chilliwack Valley, August 29, 1901 (*J. M. Macoun*, Herb. Geol. Surv. Can. no. 26026).

9. A. caninum (L.) Beauv. var. Hornemanni (Koch) Pease &

[1] In the White Mountains spikes generally green and thick. N. B. the ciliation referred to is characteristic of the entire group.

[2] Very narrow or revolute leaves are not common in the group.

Moore f. **pilosifolium** Pease & Moore, f. nov. foliis supra sparsim pilosis.[1]

Type specimen: Maine, Dead River, Somerset Co., August 19, 1896 (*M. L. Fernald*, no. 576).

10. A. caninum (L.) Beauv. var. **andinum** (Scribn. & Sm.) Pease & Moore, comb. nov. Length of the spikes (without the terminal awns) 4.3–9.5 cm. (mostly 5–7 cm.); width (exclusive of the awns) 5–8 mm.; awns 9–20 mm. long, slightly spreading, not strongly recurved as in the following.

Agropyron violaceum (Hornem.) Lange var. *andinum* Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 30 (Feb. 6, 1897).

A. biflorum (Brign.) R. & S. subsp. *andinum* (Scribn. & Sm.) Piper, Bull. Torr. Bot. Club, xxxii, 547 (Oct. 21, 1905).

A. andinum (Scribn. & Sm.) Rydb. Flora Colo. 54 (1906).

Specimens examined: Montana, Cedar Mt., July 16, 1897 (*P. A. Rydberg* and *E. A. Bessey*, no. 3705): Wyoming, Dunraven Peak, August 27, 1899 (*A. & E. Nelson*, no. 6726); Telephone Mines, Albany Co., August 1, 1900 (*A. Nelson*, no. 7894): Colorado, Silver Plume, August 24, 1895 (*C. L. Shear*, no. 393); Mt. Kelso, near Torrey's Peak, 13000 ft., 1885 (*G. W. Letterman*).

11. A. caninum (L.) Beauv. var. **Gmelini** (Ledeb.) Pease & Moore, comb. nov. Size of spikes as in the preceding; awns tending to be longer, 1.2–3.3 cm. long, bent outward almost at right angles, or, at least, strongly recurved.

Triticum caninum L. var. *Gmelini* Ledeb. Flora Alt. i, 118 (1829); Ic. Pl. nov. imperf. cogn. Flor. Ross. iii, 16, t. 248 (1831), Griseb. according to Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 31 (Feb. 6, 1897), not Triticum Gmelini Trin. ex Schrad. in Linnaea, xii, 467 (1838), "radix repens."

Agropyrum caninum (L.) Beauv. var. *Gmelini* Ledeb., according to Vasey, Bull. Torr. Bot. Club, x, 128 (Dec. 1883), publ. without reference to a previously described plant and hence invalid.

Agropyron Gmelini (Ledeb.) Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 30 (Feb. 6, 1897).

Specimens examined: Wyoming, Meeteetse Creek, 1897 (*T. A. Williams*, no. 2911); Telephone Mines, Albany Co., August 1, 1900 (*A. Nelson*, no. 7892): Colorado, Silver Plume, August 24, 1895 (*P. A. Rydberg*, no. 2453): Buena Vista, Chaffee Co., August 14–20, 1896 (*C. L. Shear*, no. 1013): Idaho, Mt. Chauvet, July 29, 1879 (*P. A. Rydberg* and *E. A. Bessey*, no. 3712): California, Carson Pass (*W. H. Brewer*, Cal. State Surv. no. 2118).

12.[2] A. caninum (L.) Beauv. var. Gmelini (Ledeb.) Pease &

[1] Besides this difference from the common White Mountain plant, the sterile shoots are more abundant, a character which is not likely to prove important.

[2] Nos. 7–12, incl. do not average as tall as nos. 1–6 incl., seldom having to be bent to get them on to a sheet. Nos. 13 and 14 are of like stature with nos. 1–6.

Moore f. **Pringlei** (Scribn. & Sm.) Pease & Moore, comb. nov. Leaves (rarely the sheaths also) finely and densely pubescent, or with scattered hairs on one or both sides.

Agropyron Gmelini (Ledeb.) Scribn. & Sm. var. *Pringlei* Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 31 (Feb. 6, 1897).

A. Scribneri Vasey, Bull. Torr. Bot. Club, x, 128 (Dec. 1883); Scribn. & Sm. l. c.

Specimens examined: Montana, Little Belt Mountains, August 12, 1883 (*F. Lamson Scribner*, no. 427), "A. Scribneri, Type": Wyoming, Medicine Bow Mountains, Albany Co., August 31, 1903 (*L. N. Goodding*, no. 2043): Colorado, Gray's Peak and vicinity, 11–14000 ft., August, 1885 (*H. N. Patterson*, no. 162); near Pagosa Peak, 12000 ft., August, 1899 (*C. F. Baker*, no. 141): California, Summit Valley, Sierra Nevada Mountains, September 23, 1882 (*C. G. Pringle*) — Type of *A. caninum.* var. *Pringlei.*

13. A. caninum (L.) Beauv. var. unilaterale (Cassidy) Vasey. Size of spikes as in the type, except that the awns usually give them the appearance of being wider (6–8 mm.); awns ascending or appressed (generally unequally so, giving the spikes a unilateral appearance), from 2–5 cm. long (average 3–4 cm.).— Contr. U. S. Nat. Herb. i. 279 (Oct. 31, 1893).

Agropyrum unilaterale Cassidy, Colo. State Agr. Coll. Exper. Sta. Bull. no. 12, 63 (July, 1890); Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 29 (Feb. 6, 1897).

Agropyron caninum (L.) Beauv. f. *violacescens* Ramaley, Geol. Nat. Hist. Surv. Minn.— Minn. Bot. Studies, Bull. no. 9, 3, 107 (June 9, 1894).

A. violacescens (Ramaley [1]) Beal, Grasses N. A. ii, 635 (1896).

A. violascens Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 29 (Feb. 6, 1897).

A. Richardsoni (Trin.) Schrad. according to Scribn. & Sm. l. c., probably not A. Richardsoni Hort. Berol., Ind. Sem. Hort. Bot. Berol. 1831 Collect. (1832), nomen nudum.

Triticum Richardsoni Scribn. & Sm. l. c., not T. Richardsoni Schrad., Linnaea, xii, 467 (1838), Trin. according to Scribn. & Sm. l. c.

Specimens examined: District of Columbia, Plot 151, Potomac Flats, June 19, 1902 (*Pollock* and *Ball*)— Mixed with no. 4: Colorado, Dillon (*C. L. Shear*, no. 1067); Twin Lakes, 1873 (*J. Wolfe*, no. 1168): Oregon, ("*Dr. Gardner*"): Alberta, Devil's Head Lake, Banff, August 3, 1891 (*J. Macoun*), with comparatively short awns: Assiniboia, Eagle Hills, July 25, 1879 (*J. Macoun*); Cypress Hills, August 2, 1880 (*J. Macoun*).

14. A. caninum (L.) Beauv. var. unilaterale (Cassidy) Vasey f. **ciliatum** (Scribn. & Sm.) Pease & Moore, comb. nov. Sheaths varying

[1] Erroneously cited by Beal as R. Pound from the title-page of an earlier article on the Mucoraceae.

from pubescent to sparsely pilose; leaves sometimes glabrous, sometimes with scattered hairs.

Agropyron Richardsoni (Trin.) Schrad. var. *ciliatum* Scribn. & Sm. U. S. Dept. Agr. Div. Agrost. Bull. no. 4, 29 (Feb. 6, 1897).

Specimens examined: New York?, Ex Coll. G. W. Clinton, "Buffalo, N. Y." [1]: Ontario, Near Shannonville, Hastings Co., June 2, 1865 (*J. Macoun*, no. 3): Iowa, Jewell Junction, July, 1895 (*G. W. Carver*, no. 255): Montana, Hound Creek Valley, August 1, 1883 (*F. Lamson Scribner*, no. 422); Dry Fork of Belt Creek, August 14, 1896 (*P. A. Rydberg*, no. 3352): North Dakota, Leeds, July 8, 1901 (*J. Lunell*): British Columbia, Field, August 19, 1904 (*J. Macoun*, Herb. Geol. Surv. Can. no. 64790).

TWO NEW GALIUMS FROM NORTHEASTERN AMERICA.

M. L. Fernald and K. M. Wiegand.

Until twelve years ago the group of slender, flaccid, blunt-leaved plants, of which *Galium trifidum* L. is the type, was supposed to be represented in North America by *G. trifidum* itself with two varieties and by the little known *G. Brandegei* Gray of the southern Rocky Mountains. In 1897,[2] however, it was shown to consist of seven clearly marked species and several varieties; and subsequently one of the plants of northeastern America, then considered a variety, has been found worthy of specific rank as *G. labradoricum* Wiegand.[3]

For several years there has been collected, chiefly on salt marshes and brackish soils about the Gulf of St. Lawrence, in eastern Newfoundland and in eastern Maine, a plant which, in habit and elongate arching pedicels, is clearly a phase of *Galium trifidum*. But this plant of saline soils is almost invariably smooth, in all the material examined nearly or quite lacking the retrorse-scabrous character of true *G. trifidum*; and it has slightly larger fruit, the mature carpels being 1.5–1.75 mm. in diameter. On the other hand, all the material of *G. trifidum* from situations which are not saline is harsh with minute

[1] It is uncertain whether "Buffalo, N. Y.," is only the collector's address or also the place of collection.

[2] Wiegand, Bull. Torr. Bot. Cl. xxiv. 389–403 (1897).

[3] Rhodora, vi. 21 (1904).

retrorse prickles which occur upon the stems, leaves, and pedicels; and its mature carpels are 1.25–1.5 mm. in diameter. The smooth plant appears to be a well marked halophytic variety, which is here proposed as

Galium trifidum L., var. **halophilum**, n. var., omnino ut *G. trifidum* sed caulibus foliis pedicellisque glabris; carpellis maturis paulo majoribus (1.5–1.75 mm. diametro).

Like the typical form of the species, but with stems, leaves, and pedicels glabrous; fruit slightly larger (the individual carpels 1.5–1.75 mm. in diameter).— Quebec: brackish marshes at mouth of Bonaventure River, August 2–4, 1904, *Collins, Fernald, & Pease*, (type specimen in Gray Herb.); borders of a salt marsh, Matane, August 6, 1904 (*F. F. Forbes*); brackish shore, Rivière du Loup, August 31, 1904 (*Collins & Fernald*); salt marsh, Bic, July 25, 26, 1907 (*Fernald & Collins*, no. 1181). Newfoundland: Barred Islands, August 20, 1903, *J. D. Sornborger*. Prince Edward Island: bog near Tracadie Beach, July 27, 1901, *J. R. Churchill*. New Brunswick: brackish marsh at mouth of Tête-à-Gauche River, Bathurst, July 24, 1902, *Williams & Fernald*. Maine: North Lubec, September, 1902, *Kate Furbish*; edge of salt marsh, South Lubec, July 26, 1909 (*Wiegand*); pools and wet rocks by the sea, Cutler, July 2, 1902, *Kennedy, Williams, Collins, & Fernald*, August 19, 1902, *Kate Furbish*.

Another plant related to *Galium trifidum* has been collected in Arbor Vitae swamps and on marly or calcareous shores of Gaspé County, Quebec, and Aroostook County, Maine. This plant, which had been placed tentatively with *G. trifidum*, var. *subbiflorum* Wiegand, is densely matted, and has the tiny fruits on glabrous pedicels which are only 0.5–4 mm. long, and the mature carpels 0.8–1 mm. in diameter. From typical *G. trifidum* it differs in its short internodes, short glabrous pedicels, and smaller fruit; the fully developed retrorse-scabrous pedicels of *G. trifidum* being 0.8–2 cm. long, and the ripe carpels 1.25–1.5 mm. in diameter. From *G. trifidum*, var. *subbiflorum*, which has glabrous pedicels, it is readily distinguished by its very short pedicels and small fruit; from var. *halophilum* by its slightly scabrous stems, very short pedicels, and tiny fruit; and from *G. Brandegei* Gray, of the southern Rocky Mountains, by its more scabrous stems and leaves, shorter pedicels, and smaller fruit, the mature carpels of *G. Brandegei* being 1.7–2 mm. in diameter. So far as the writers are able to find, the small-fruited plant of Quebec and Maine has not been described, and it may appropriately be called

Galium **brevipes**, n. sp., humile valde implicatum, caulibus

0.5–3 dm. longis ramosissimis glabrescentibus vel paulo retrorso-scabris, internodiis longioribus 1–3 cm. longis; foliis plerumque 4is subinequalibus oblanceolatis vel oblongo-lanceolatis obtusis cuneatis 2–10 mm. longis 1–nerviis glabris vel margine et subtus in nervo scabris; floribus axillaribus solitariis vel binis; pedicellis arcuatis glabris demum 0.5–4 mm. longis; corollis minutis albidis, lobis 3 obtusis; fructu glabro, carpellis maturis 0.8–1 mm. diametro, endospermo in sectione transversali annulare.

Plants low and densely matted; the stems 0.5–3 dm. long, freely branched, smoothish or somewhat retrorse-scabrous, the longer internodes 1–3 cm. long: leaves mostly in 4s, somewhat unequal, oblanceolate to oblong-lanceolate, obtuse, cuneate at base, 2–10 mm. long, 1-nerved, smooth or somewhat retrorse-scabrous on the margin and midrib beneath: flowers axillary, solitary or paired: pedicels curved, glabrous, finally 0.5–4 mm. long: corolla minute, 3-lobed, the lobes obtuse, whitish: fruit glabrous, the mature carpels 0.8–1 mm. in diameter; cross-section of the endosperm annular.— Quebec: exsiccated marl-pond near mouth of the Grand River, Gaspé County, August 11–15, 1904, *Collins, Fernald & Pease*, (type specimen in Gray Herb.). Maine: Arbor Vitae swamp, Mars Hill, September 8, 1896, *Fernald*: muddy flat of the Meduxnekeag River, New Limerick, August 13, 1909, *Fernald & Wiegand — Fernald*, no. 2169.

A new Variety of Rhamnus caroliniana.— While attempting to find better characters for the separation of *Rhamnus caroliniana* Walt. and *R. Frangula* L. than those stated in the seventh edition of Gray's Manual,[1] I noticed that, although most of the material of *R. caroliniana* has glabrous or glabrate leaves, there are several sheets of specimens in the Gray Herbarium on which the mature leaves are densely velvety beneath, thus differing pronouncedly from the typical form of the species. This extreme variation may be called

Rhamnus caroliniana Walt., var. **mollis**, n. var., foliis maturis subtus velutinis.— Kentucky: without statement of locality, *C. W. Short*. Illinois: Grand Tower, *Geo. Vasey* (type, in Gray Herb.). Texas: creek-banks, Houston, April 3, 1872, *E. Hall*, no. 99; uncommon in woods, Columbia, April 15, 1899, *B. F. Bush*, no. 165.— M. L. Fernald, Gray Herbarium.

[1] The mature leaves of *Rhamnus Frangula* are 3–7 cm. long, short-oblong to obovate; and the pedicels and calyces are glabrous or essentially so. The mature leaves of *R. caroliniana*, which apparently is unknown in the Atlantic States north of Virginia, are 4–15 cm. long; and the pedicels are distinctly pubescent, the calyx pubescent or rarely glabrate.

Botrychium obliquum var. oneidense in eastern Massachusetts.— I am indebted to Prof. B. L. Robinson for the identification as *Botrychium obliquum* var. *oneidense* (Gilbert) Waters of a sheet (No. 277) in my herbarium, which I collected on 8 March, 1909, in Canton, Mass. The plants were growing in rather rich soil along the edge of a shady road bordered by woods. This is apparently the first record of this variety for the eastern part of the state.— Sidney F. Blake, Stoughton, Massachusetts.

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